

# MACROS: Molecular Analyzer for Complex Refractory Organic-rich Surfaces

Completed Technology Project (2014 - 2018)

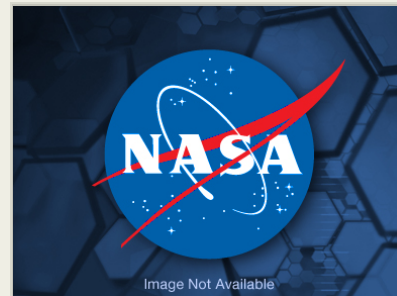


## Project Introduction

MACROS will be capable of comprehensively analyzing the surface chemistry of astrobiologically important planetary bodies to determine the composition of small, soluble organic molecules, non-volatile macromolecular organic carbon reservoirs, and inorganic composition of local mineralogy that can play a role in organic and inorganic chemical processes during planetary body evolution. Future landed missions to solar system destinations of high astrochemical and astrobiological interest will require science instrumentation capable of conducting broad, comprehensive, and highly sensitive in situ analyses of surface materials. A primary goal of any such landed mission will be a detailed characterization of the local chemical environment. MACROS will assess habitability (as in the case of Europa, Enceladus, or Titan) and/or assess the possible role of small bodies in the seeding of organic compounds on early Earth and throughout the solar system (as in the case of icy asteroids and comets). MACROS is an advanced laser desorption/ionization mass spectrometer (LDMS), capable of sample acquisition, solvent extraction, and presentation of liquid analyte at the inlet of the mass spectrometer, that will provide sophisticated sample analysis beyond the capabilities of LDMS alone. The outcome of the proposed work will be a MACROS instrument laboratory prototype that will determine inorganic mineral composition, broadband organic sample content, and detailed structural analysis of high-priority compound classes for a thorough understanding of the chemistry of planetary surface materials.

## Anticipated Benefits

The results of this project will be used by NASA's OSIRIS-REx mission to design, construct, and operate their dedicated asteroid sample curation laboratory. If NASA receives samples from the JAXA Hayabusa-2 mission, these results will be critical to design of a curation laboratory for those samples



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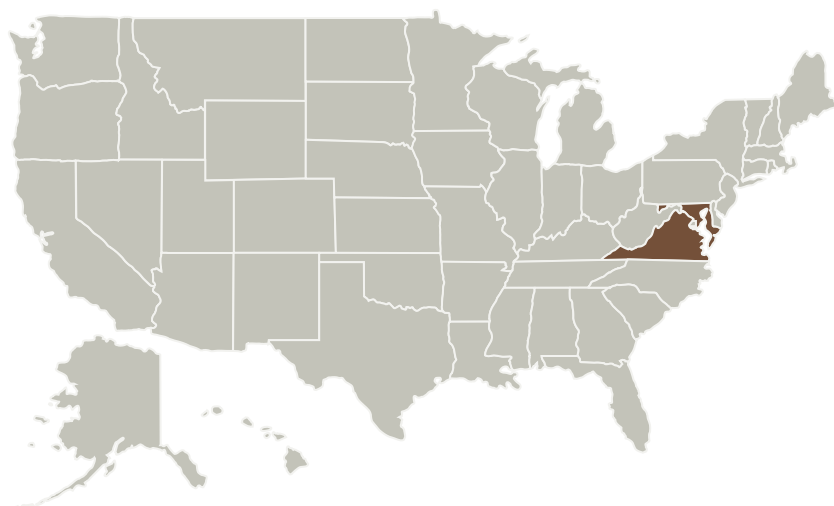
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Max-Planck-Institut fuer Radioastronomie(MPIfR)	Lead Organization	Industry	Bonn, Outside the United States, Germany

Primary U.S. Work Locations	
Maryland	Virginia

## Organizational Responsibility

### Responsible Mission Directorate:

Science Mission Directorate (SMD)

### Lead Organization:

Max-Planck-Institut fuer Radioastronomie (MPIfR)

### Responsible Program:

Planetary Instrument Concepts for the Advancement of Solar System Observations

## Project Management

### Program Director:

Carolyn R Mercer

### Program Manager:

Haris Riris

### Principal Investigator:

Stephanie A Getty

### Co-Investigators:

Xiang Li  
 Jason P Dworkin  
 Timothy J Cornish  
 David T Leisawitz  
 William B Brinckerhoff  
 Adrian E Southard  
 Manuel A Balvin  
 Paul Mahaffy  
 Daniel P Glavin  
 Jerome P Ferrance  
 Andrej Grubisic  
 Jamie Elsila

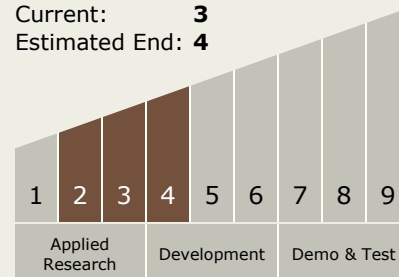
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## Technology Maturity (TRL)

Start: **2**  
Current: **3**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.3 In-Situ Instruments and Sensors
    - └ TX08.3.4 Environment Sensors

## Target Destination

Others Inside the Solar System